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Chapter 18

Glossary of Indigenous Fermented Foods

by

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A great many food fermentations are known in the world. Extensive and accurate information is readily available on a number of such well-known processes as alcoholic fermentation, yeast in breadmaking, fermentation of milk to cheese, sauerkraut made by lactic acid bacteria, and vinegar fermentation, but information on many of the others is scarce, fragmentary and confusing in the English literature.

The use of microorganisms in the processing of foods, especially traditional processes, has been a neglected field of research in food technology. Not until the late 1950's were studied on oriental food fermentation begun in the United States, and Hesseltine (1965) compiled the first list of traditional food fermentations in 1965. The work made us aware of how little Americans and Europeans know of this field of applied microbiology.

Continuing U.S. studies on traditional foods, on the other hand, have developed a public awareness of the importance of studying indigenous foods in many countries and an increased recognition of the real and practical food problems in their countries that need to be investigated. These problems include food safety, nutritional value, improved production methods, and reduced production costs. Consequently, a number of international symposia and workshops on traditional food fermentation have been held in the last decade, resulting in an increasing exchange of information between scientists and food technologists. Thus, we feel the need for bringing up to date the list of traditional food fermentations.

The glossary covers those less known fermented foods of the world where they are an integral part of the country's diet as staples or condiments and with which people outside the country are unfamiliar. In many cases, no scientific information can be cited; in some, only a single or fragmentary reference can be found and this is cited. Although

it is impossible to review all the literature, lists of review articles and symposia on the subject are included for those food fermentations that have been investigated in recent years. The glossary, verified and supplemented by scientists of involved countries, includes information from many countries and offers a wealth of knowledge for future investigations.

Fermented Cereal Products

AGIDI: Soured corn meal of Nigeria, cooked in banana leaves. See ogi.

AMBALI: Fermented product of East Indian cereal grass called ragi [*Eleusine coracana* (L.) Gaertn.]. Ragi flour is made into a thick batter with water and allowed to ferment for 14 hours. The fermented ragi batter is then added to cooked rice while stirring to avoid lump formation. It is allowed to cool, mixed with sour buttermilk, and consumed. The microorganisms are *Leuconostoc mesenteroides* (Tsenk.) V. Tieghem, *Lactobacillus fermentum* Beij., and *Saccharomyces* sp.

ANG-KAK (anka, amkak, angkhak, ang-quai, aga-koji, akakoji): Literally means red rice. It is made in China by fermenting rice with certain strains of *Monascus purpureus* Went, such as NRRL 2897, in a solid-state fermentation. Because of its red color, ang-kak is used as a food coloring agent for cooking as well as for manufacturing such fermented foods as fish sauce, fish paste, sufu, and red wine. Recently, mutants of *Monascus* sp. have been isolated, and they produced large amounts of pigment by submerged culture with rice powder as the sole carbon source.

APEM: Steamed rice bread of Indonesia especially popular in Bali. It is made from white rice flour fermented overnight and steamed in cups. The main microorganisms used in the fermentation are *Saccharomyces* spp. and *Leuconostoc mesenteroides.*

ARAK (arack, arrack): See brem.

BAKHAR: Inoculum used in Northern India to manufacture rice beer (pachwai), which contains as much as 22% alcohol. This inoculum is a species of *Mucor, Rhizopus,* and *Amylomyces* and used in the saccharification of rice starch with one or more yeasts. Certain plant materials, including ginger, are dried, powdered, and added to 8 lb of ground rice. This mixture is made into a thick paste with water and then molded into small round cakes about one and one-half cm thick. Each cake is dusted with powdered cake from a previous batch, wrapped in leaves, and allowed to ferment for 3 days. The cakes then are dried, preferably in the sun.

BASI: Produced in the Philippines, similar to Indonesian tapé. Also see binubran.

BENI-KOJI (beng-koji): See ang-kak.

BINUBRAN: Fermented rice product of the Philippines, similar to Indonesian tapé. Also see basi.

BREM: Solid yellowish-white fermented rice mass having a sweetish-sour flavour, consumed in Central and East Java, Indonesia. It is made from glutinous rice inoculated with ragi similar to that of tapé ketan, but the fermentation is allowed to go longer resulting in greater liquefaction of the rice. The fermentation mixture is pressed and the liquid is evaporated until it attains the consistency of a syrup, which is then placed in small cones. After cooling, the syrup solidifies to give a solid candy. The liquid is also consumed as an alcoholic beverage known as arak or brem bali.

BUBOD: A starter for making binubudan in the Philippines. It is similar to ragi of Indonesia.

CHAO: Fermented rice of Cambodia.

CHICHA: Fermentation of maize in Peru, but certain other substrates also may be used. Presumably yeasts are involved. Nicholson. 1960. Econ. Bot. 14: 290-299.

CHICKWANGUE: Bacteria-fermented cassava of the Congo.

CHINESE YEAST BALL: See peh-chu or ragi.

CHIU-CHU: Type of Chinese chu used for alcoholic fermentation. The most frequently used molds are the *Rhizopus* spp. See chu.

CHIU-NIANG: Also known as lao-chao. It is a Chinese fermented rice, somewhat like Indonesian tapé ketan, prepared by fermenting steamed glutinous rice with a starter (peh-chu) containing molds and yeasts. The fermented rice is soft, juicy, sweetish, and slightly alcoholic. It is served with or without further cooking, mainly as a dessert. Wang and Hesseltine. 1970. Agric. Food Chem. 18: 572-575.

CHIU-YUEH: See peh-chu.

CHU (chou): Chinese term for molded masses of various cereals or soybeans, similar to Japanese koji. The molds used are strains of *Aspergillus oryzae* (Ahlburg) Cohn or strains of *Rhizopus* spp. The chu serves primarily as sources of enzymes, although in some instances it is used as a source of inoculum. There are various types of chu, and each type uses different microorganisms for different purposes.

DABBO: Leavened bread made from wheat in Ethiopia.

FERMENTED MINCHIN: See meiminchin.

GARI: Fermented cassava of Nigeria and West Africa. It has a sour taste and usually is eaten with bean-flour or fish. There are similar foods in South America.

INJERA: Fermentation of teff, and African cereal grass *Eragrostis tef* (Zuccagni) Trotter, in Ethiopia to make a bread-like product resembling U.S. pancakes. The fermentation uses an impure culture, but the principal organism is *Candida guillermondii* (Castellani) Langeron et Guerra. A starter from a previous fermentation is used to begin new fermentations. A detailed discussion of the fermentation is given by Stewart and Getachew. 1962. Econ. Bot. 16: 127-130.

JALEBIES: Pretzel-like, syrup-filled confections prepared from deep-fried fermented, wheat flour dough. They are consumed throughout India, Nepal, and Pakistan. Microorganisms isolated were *Saccharomyces bayanus* Sacc. and *Lactobacillus*.

JAMIN-BANG: Fermented maize product of the Kaingang Indians of Brazil. Maize is placed in wicker baskets and immersed in a stream for several days. This steeped corn is then ground into a pulp, placed in baskets lined with leaves, covered with leaves, and allowed to ferment for 3 to 6 days. The product then is rolled into flat cakes and baked. Apparently two yeasts and a bacterium are involved, and the product has some alcohol and acid in it. Lieske. 1914. J. Inst. Brew. 20: 304-305.

JAVA YEAST: See ragi.

JOENKUK: Korean starter. See tane koji.

JOONGPYUN (jeungpyon): Korean steamed rice bread. It is prepared by steaming a fermented dough made from glutinous rice flour and rice wine.

KAANGA-KOPUWAI: Primitive process of fermenting whole ears of maize by placing unhusked corn in jute sacks, weighted with stones, and submerging the sacks in streams or ponds. The corn is left for 3 months or more before removal from the water. At this time, the grain is full and very soft and slimy to the touch but has a fresh appearance and strong flavor. Fermentation without the cob is said to give an inferior flavor. The fermented kernels are then ground and boiled to form a sort of gruel for consumption. This crude fashion of fermenting maize is used by the Maoris of New Zealand and a similar process is used for corn in Peru. Yen. 1969. Econ. Bot. 13: 319-327.

KAANGA-PIRACE: See kaanga-kopuwai. A term used among the Maoris of Central North Island and the Bay of Plenty, New Zealand.

KAANGA-WAI: See kaanga-pirace.

KALI: Fermented rice product in India. To leftover cooked rice, water is added, and the mixture is allowed to ferment overnight.

KANJIKA: Sour rice gruel used by the Dravidians of India.

KARUKAN: Steamed rice bread from Kagoshima in Southern Japan.

KENKEY: Steamed fermented maize mush of Ghana.

KHABZ: Leavened bread of unbleached white or whole wheat flour of the Middle East.

KH-A-MIR: Yeast or leaven in several Indian languages.

KHANOM-CHIN (khanom-jeen, khanom cheen): Fermented rice noodle of Thailand prepared from glutinous rice flour.

KHANOM-TAN: Fermented spongy rice cake of Thailand made from glutinous rice flour. It is sweet and used as a dessert.

KHANOM-THUAI-FU: Fermented spongy rice cake of Thailand. It is sweet and used as a dessert.

KHAO-MAK: Fermented semi-solid rice product of Thailand. It is prepared from glutinous rice and has a sweetish-alcoholic taste. The product is similar to Indonesian tapé and Chinese lao-chao.

KIMOTO: Seed mash (moto) in Japanese saké brewing that is acidified by naturally occurring lactic acid bacteria.

KISHK: Wheat-milk mixture commonly found throughout the Arab world. See kushik. Morcos et al. 1973. J. Sci. Food Agric. 24: 1157.

KOCHO: Ethiopian fermented food made from corn and pulp of decorticated ensete [*Ensete ventricosum* (Welw.) Cheesem.], an Abyssinian banana plant. The fermented product is baked as bread or cooked as porridge. Vogel et al. 1977. Abstracts, Symposium on Indigenous Fermented Foods, Bangkok, Thailand.

KOJI: Japanese term for molded masses of various cereals or soybeans similar to Chines term, chu and Korean term, kuk. The molds used are strains of *Aspergillus oryzae* (Ahlburg) Cohn or closely related species. The molded material serves primarily as sources of enzymes although in some instances it is used as a source of inoculum. Each type of koji uses different strains. Thus, certain mixtures of strains are used for shoyu, others for miso, and still others for saké.

KUK: Korean koji.

KUNDALINI: Same as jalebies.

KUSHIK (kushuk): Fermented food prepared by using one part of dried parboiled whole wheat meal and two parts of yoghurt fermented

together for a week. To this fermented mash is added the curd from an equal volume of milk, and further fermentation goes on for 4 to 5 days. The product is sun dried and powdered and can be stored for a long time. About 20 to 30 kg are consumed per person annually in Northern Iraq. Platt. 1964. Food Technol. 18: 68-76.

LAFUN: Bacteria-fermented cassava of Nigeria. It is a paste used as a staple food.

LAO-CHAO: See chiu-niang.

LARU: Indonesian local name for traditional inoculum. See ragi.

LUK-PAENG (luck paeng): Starter used in Thailand equivalent to ragi.

MANDAKA: Bread of India prepared with wheat or rice flour.

MAN-TOU: Steamed yeast dough of China made from wheat flour.

MEIMINCHIN (mei-min-chin): Chinese name for molded wheat gluten. Fresh minchin (wheat gluten) is put in a container and tightly covered. After 2 or 3 weeks at room temperature, it will be overgrown with molds and bacteria. At the end of this time, sodium chloride is added equal to 10% of the molded mei-min-chin. After the salt is mixed thoroughly into the minchin, it is allowed to stand for 2 more weeks to age. For eating, it is cut into thin strips and commonly used as a condiment with other foods. Usually the fermentation is carried on during the winter because in hot weather it spoils rapidly from bacteria. This food is commonly eaten by people in northern China and appears to have a mixture of mold including *Paecilomyces, Aspergillus, Cladosporium, Fusarium, Syncephalastrum, Penicillium,* and *Trichothecium.* Shih. 1937. Lingnan Sci. J. 16: 27-38.

MIRIN: Condiment prepared by mixing shochu (a clear distilled liquor) or ethyl alcohol, rice koji, and steamed glutinous rice. This mixture is allowed to age in the presence of about 20% alcohol. The chemical changes are due to the action of the enzymes in the koji. This material has an extremely fragrant odor and is used in sauces for meats and sea foods. Watanabe. 1964. U.S. Patent 3, 124, 465.

MOROMI: Japanese term for the fermentation mash (main mash) containing koji, yeast, and bacteria during the second-stage fermentation of saké and soy sauce.

MOTO: Starter or seed mash for saké yeast in Japan.

NAN: Leavened bread of unbleached, white, or whole wheat flour. It is used in India, Pakistan, Afghanistan, and Iran, same as khabz of the Middle East.

NURUK: Korean term for a starter used for liquor brewing. It is made from wheat dough naturally inoculated or inoculated with appropriate pure cultures such as *Aspergillus usamii* Sakaguchi et al., *A. awamori* Nakazawa, or *Saccharomyces cerevisiae* Hansen.

OGI: Fermented maize cake from Dahomey, Nigeria. See agidi. Banigo and Muller. 1972. Can. Inst. Food Sci. Technol. J. 5(4): 217-221.

PEH-CHU: Type of Chinese chu used as starter for making chu-niang or lao-chao. It is similar to Indonesian ragi prepared from rice and contains *Amylomyces rouxii* Calmette, *Rhizopus chinensis* Saito, *Saccharomycopsis fibuligera* (Linder) Klocker, and *S. malanga* (Dwidjoseputon) Kurtzman et al.

PEH-KHAK: See peh chu.

PEH-YUEH: See peh chu.

PEUJEUM (peyem, peuyeum): See tapé ketella.

POI: A short-time fermentation of crushed taro corms in Hawaii in which the chief organisms for the first 3 days of the fermentation are *Lactobacillus pastorianus* (V. Laer) Bergey et al., *L. delbrueckii* (Leichmann) Beijerinck, *L. pentoaceticus* Fred et al., *Streptococcus lactis* (Lester) Lohnis, and *S. kefir* Migula. These orgnisms produce large amounts of acid and are followed in the next 3 to 6 days by the development of *Mycoderma cerevisiae* Desm., *Oidium lactis* Fres., and acid-resisting yeasts. No starters are used, and the fermentation is very similar to the souring of milk. Allen and Allen. 1933. Hawaii Agric. Exp. Sta. Bull. 70, p. 1-32.

POLVILHO AZEDO: A Brazialian fermented and sun-dried cassava starch product. Nakamura and Sark. 1975. Staerke 27: 295-297.

POZOL: Fermented maize dough diluted with water used as a basic food by Indians in Mexico. Ulloa and Kurtzman. 1975. Bol. Soc. Mex. Mic. 9: 7-12.

PUTO: Steamed rice bread with carmelized coconut milk from the Philippines.

RABDI: Maize food in India. Maize flour is cooked in water. After cooling, buttermilk is added and the mixture is allowed to ferment overnight. Detected microorganisms were *Pediococcus acidilactici* Lindner, *Bacillus* sp., and *Microbacterium flavum* Orla-Jensen.

RAGI: Indonesien term for starter or inoculum, but in the West, ragi refers to Indonesian yeast cakes or Java yeast similar to Chinese yeast ball or peh chu. Ragi is not consumed as such but is used as a starter primarily for making fermented product, tempeh, tapé, and rice wines.

To make ragi, rice flour is mixed well with small amounts of each or some of the following spices: garlic, ginger, langkuas, jeruk nipies, pepper, sugar, and others. The exact proportions of these spices varies with the manufacturer and is generally a trade secret. The spices were said to maintain the desired balance of microorganisms. Enough water is added to form a thick paste, which is then shaped into small cakes or balls of 3 to 4 cm in diameter and placed on woven bamboo trays lined with rice straw. In some cases, powdered old ragi is sprinkled over the balls, or it is added in the dry mixture, but some makers do not use any inoculum. The trays are stacked and kept in a room at 25 to 35°C for 2 to 5 days and then sun-dried. Ragi is usually sold as grayish-white small cakes or balls. The dominant microorganisms are *Amylomyces rouxii* Calmette, *Rhizopus chinensis* Saito, *Saccharomycopsis fibuligera* (Lindner) Klocker, *S. malanga* (Dwidjoseputon) Kurtzmann et al.

RED RICE: See ang-kak.

ROTI-JUAR: Bread from India prepared with jowar flour (Indian millet).

SAMSUL: Malaysian name for fermented rice. See tapé ketan.

SEKIHAN: Japanese name for red rice. See ang-kak.

SHIRO KOJI: Japanese name for Chinese peh-chu.

SIERRA RICE: Fermented rice of Ecuador. Van Veen et al. 1968. Arch. Lationam. Nutr. 18: 363.

SOKUJO-MOTO: Seed mash (moto) in Japanese saké brewing, which is acidified by adding 0.5% lactic acid for quick moromi making.

SOMA: Fermented rice of India.

SOURDOUGH BREAD: Bread with wheat flour and a mixture of yeasts and lactic acid bacteria.

SWEET FLOUR PASTE: See tien mien chiang.

TANE KOJI: Japanese term for an inoculum used to start koji for use in various fermentations.

TAPAI: Malaysian fermented rice product similar to Indonesian tapé ketan. See tapé ketan.

TAPÉ (tapeh): See tapé ketan and tapé ketella.

TAPÉ KETAN: Indonesian name for a product made by adding ragi to cooked glutinous rice. This mixture is wrapped in banana leaves and left to ferment at room temperature. In 2 or 3 days, the rice becomes soft, moist, sweet, sour, and alcoholic. The rice is then consumed as a dessert. It is also known as peuyeum ketan in Sundanese. The product is similar to lao-chao of China.

TAPÉ KETELLA (tapé ketela): Indonesian food prepared by fermenting cassava with powdered ragi. The peeled cassava tubes are washed, cut into pieces about 2 × 4 cm, and steamed. After cooling, the steamed cassava are mixed with ragi and wrapped in banana leaves. Cassava may be cut into larger pieces, however, as much as 30-cm long and with a diameter of 4 cm. The larger pieces are placed in a bamboo tray lined with banana leaves and left unwrapped. After 2 to 3 days, at 25 to 30°C, the material becomes soft and has a sour and sweet alcoholic taste. The fermented cassava is then consumed or fried in coconut oil. Also known as peuyeum in Sundanese and tapé telo in Javanese.

TAPÉ SINGKONG: See tapé ketella.

TAPÉ TELO: Javanese name for tapé ketella. See tapé ketella.

TARHANA: Turkish fermented food prepared from parboiled wheat meal and yogurt at a wheat-to-yogurt ratio of 2:1. To this material vegetables are added; the mixture is allowed to ferment for several days and then is sun dried. Platt. 1964. Food Technol. 18: 68-76.

THUMBA: Fermentation of millet used in West Bengal. The seed is boiled and, after cooking, is inoculated with a yeast that is sold in bazaars in the form of small cakes mixed with the ground roorts of a jungle plant. The millet is fermented for about 10 days in sections of bamboo, during which time it is turned frequently. After fermentation is completed, the supernatant liquor is removed; after cooling, it is imbibed. The yeast involved has been isolated, and a culture is maintained at the ARS Culture Collection as NRRL Y-5395, *Endomycopsis fibuligera* (Lindner) Dekker.

TIEN-CHIU-NINANG: See chiu-niang.

TIEN-MIEN-CHIANG: A Chinese food made from wheat flour. It has a slightly sweet taste and is a dark brown paste made by fermenting steamed wheat flour yeast dough with *Aspergillus* molds. The molded mass is aged in brine solution under sun or warm temperatures for a few months. It is used as a flavoring agent.

TOIFU: Steamed rice bread from Thailand.

TORANI: Rice ferment of India used as a starter for fermenting beverage from carrot mixture.

TSIU-YAH (chiu yueh): See peh chu.

USAR: Indonesian local name for traditional inoculum. See ragi.

YAMAHAI-MOTO: Same as kimoto.

Fermented Legume Products

CHANNA KI WARIES: Waries made in the Pakistan district of Mianwali, Dehara Ghazi Khan, Multan, and Jhang consisting of locally grown bengal gram (*Cicer arietinum* L.) and black gram flour. See waries.

CHAO: Made in Viet-Nam by fermenting soybean curd in a fashion similar to sufu. The organism used is not known. Richard. 1959. Ind. Aliment. Agric. 76: 745-748.

CHEONGKUKJANG (chung-kook-jang): See jeonkukjang.

CHIANG-CHU: Type of Chinese chu used for soy sauce and soybean paste fermentations. Strains of *Aspergillus oryzae* (Ahlburg) Cohn and *A. sojae* Sakaguchi et Yamada are generally used. The substrate is soybeans or mixture of soybeans and wheat.

CHINESE CHEESE: See sufu.

CH'OU-TOU-FU: Fermented soybean curd from China. Cubes of soybean curd (tou-fu) are immersed into a special vegetable-stalk and salt solution for a few days. The product, probably the result of bacterial fermentation, has a strong offensive odor. It is usually consumed deep-fat fried.

CH'OU-TOU-FU-RU: A type of fermented soybean curd from China. The product has a taste and texture similar to that of sufu except it has a very strong offensive odor. It is made from cubes of soybean curd (tou-fu) by *Mucor* and bacterial fermentation. The fermented soybean curd is then aged in brine solution. See sufu.

DAGEH (dagé): Indonesian food prepared by bacterial fermentation of various leguminous seeds or the remains, extracts, or waste products of such plants as cassava or pototo peels. Seeds, for example, are steamed and the seed coats removed, the seeds soaked in water for 24 hours or more, then steamed again, put into a bamboo basket and covered with banana leaves, or wrapped in banana-leaf packets. Afte 2 to 4 days of fermentation at room temperature, the dageh is ready for consumption. Some types are served fried or mixed with oncom.

DAMBUKJANG: See damsuejang.

DAMSUEJANG: Soybean paste of Korea — similar to doenjang except that it is a rapidly fermented soybean paste. Fermentation and ripening take about 1 week, controlled by low salt concentration and high temperature (40 to 45°C). It is mainly prepared in the spring to supplement the shortage of doenjang. See doenjang.

DAWADAWA: Fermented African locust bean (*Parkia filicoidea* Welw. ex Olivo) in West Africa. Boiled, dehulled beans are covered with leaves and allowed to ferment for 2 or 3 days. The fermented mass is pounded into a paste, shaped into small balls, and sun dried. This material contains high ribflavin and 37% protein. Platt. 1964. Food Technol. 18: 68-76.

DOENJANG: Korean naturally fermented soyean paste containing about 15 to 18% salt. It is made from naturally fermented soybeans (meju) with salt. See soybean paste.

FU-RU (fu-ju, fu-ju, foo-yue, fu-yue): See sufu.

HON-FAN: Red sufu. Fermented red rice (ang-kak), molded cubes of soybean curd and salt are placed in alternate layers in vessels during aging. Ang-kak gives the product a red color. See sufu.

IDARI-KA: Fermented dough of black gram [*Vigna mungo* (L.) Hepper] flour with spices, shaped into small balls, and fried in butter. It is made and consumed in India.

IRU: Fermented African locust bean (Odunfa). 1981. J. Plant Food 3: 245-250.

IN-SHI: Fermented black soybeans from China. It is related to in-yu fermentations.

IN-YU: Type of Chinese soy sauce made from black soybeans without adding wheat or other cereals. It is made from molded (*Aspergillus, Rhizopus*) black soabean chu and then aged in brine solution. See soy sauce.

JEONKUKJANG: Soybean paste of Korea similar to doenjang and damsuejang, but the fermentation time is short. The meju is prepared at 40°C for 3 days or less, and the meju-salt mixture is kept at 60 to 70°C for 1 day. Jeonkukjang is prepared from a bacteria-grown meju. See doenjang.

JEONSHIJANG: See jeonkukjang.

KANJANG: Korean soy sauce. It has a salty, sour, and sweet taste and is made from soybeans only. The fermentation is controlled by the salt concentration (18 to 22%), and the fermentation time is short.

KECAP (kechap): See ketjap.

KENIMA: Fermented soybean product from Nepal, Sikkim, and Darjeeling districts of India. The soybeans are soaked, dehulled, boiled in water for 2 to 3 hours, drained, cooled, and then wrapped in banana leaves or other large leaves. After 24 to 28 hours at 22 to 30°C, the beans become mucilaginous. Bacteria seem to be responsible for this

fermentation. When deep fried and salted, kenima has a pleasant nut-like flavor. The product probably is similar to natto of Japan.

KETJAP: Indonesian soy sauce made from black soybeans. The soybeans are boiled and fermented with *Aspergillus oryzae* (Ahlburg) Cohn for 2 or 3 days. The fermented beans are put in salt brine for about 8 days. Then the liquid is filtered from the beans, and the residue is cooked several times in fresh water and extracted until all solubles are removed. To the extracted liquid, sugar and other flavoring agents are added. The fluid is then concentrated by slow boiling to a thick sirup that is sold as ketjap. Ko and Hesseltine. 1961. Soybean Dig. 22: 14-15.

KHAMAN: Food from India. Bengal gram is washed, soaked for 5 to 10 hours, and ground to a thick batter with salt and water. The batter is allowed to ferment overnight and then is steamed for consumption.

MAKJANG: See damsuejang.

MAME MISO: Miso made from soybeans without cereals. See miso (Fermented Cereal-Legume Product).

MEITAUZA (mei-tou-cha): Chinese food made by fermenting the residual solids (tou-cha) from manufacturing soybean milk (tou-chiang). In making soybean milk, the soybeans are wet-ground with 10 times as much water, boiled, and filtered through cloth. The residual solids are pressed into cakes of about 10 to 14 cm in diameter, 2- to 3-cm thick in the center, and 1- to 1.5-cm thick at the edges. These cakes are then placed in suitable containers and allowed to ferment for 10 to 15 days with moderate aeration.

Because the temperature should not be too high, the best meitauza is prepared in the winter. If the temperature is too high, difficulty is encountered with undesirable bacteria. The cakes become covered with a white mycelium of *Mucor meitauza* Shih. The cake is removed after a suitable time, placed in the sun for a few hours to dry, and then sold at the market. The cakes are cooked in vegetable oil or cooked with vegetables. The material is nutritious and is used as a flavoring agent. From the fresh product, Shih isolated a *Mucor,* which he carefully studied and described as a new species, *M. meitauza.* A comparison of his species illustration and his observations indicates it is a synonym of *Actinomucor elegans* (Eidam) Benjamin et Hesseltine already noted as one of the principal fungi involved in the fermentation of sufu (Chinese cheese). This fermentation is carried out only in certain areas of China such as Wuchang. Shih. 1937. Trans. Sapporo Nat. Hist. Soc. 15: 13-23.

MEJU (maiju, maeju): Korean term for a naturally fermented soybean mass in rectangular block form used for making soy sauce or soybean paste. It is similar to koji of Japan and chu of China. Microorganisms

such as *Mucor, Penicillium, Rhizopus, Aspergillus oryzae* (Ahlburg) Cohn, *Bacillus subtilis* (Ehrenberg) Cohn, *B. pumilus* Meyer and Gottheil, *Rhodotorula flava* (Saito) Lodder, and *Torulopsis dattila* (Kluyver) Lodder were found in homemade meju.

NATTO: Fermented soybean food in Japan and also in Korea though not very common in the latter country. It is made from whole soybeans by fermentation with a bacterium, *Bacillus subtilis*. The process is simple and quick, similar to that of tempeh fermentation, except that a different microorganism is used. Natto has a characteristic strong odor, flavor, and slimy appearance.

ONCOM (onchom): Popular fermented food in West Java, Indonesia, made by fermenting peanut press cake. The active microorganism used for oncom production is *Neurospora*, which produced a pink or orange product. The fermentation is carried out much like tempeh, except the material is never wrapped.

ONCOM HITAM: Type of oncom from Indonesia. It is usually made from a mixture of peanut press cake and residue of tapioca production with *Rhizopus*. See oncom.

ONCOM MERAH: Type of oncom from Indonesia. It is usually made from a mixture of peanut press cake and residues of tapioca and soybean curd production with *Neurospora*. See oncom.

ONTJOM: See oncom.

PAPADAMS: Flat, spicy, circular wafers from India. Prepared from flour paste of dehulled black gram and fermented 4 to 6 hours. The microflora recovered from them is nearly identical with that responsible for the fermentation of waries. See waries.

PEHTZE: Term applied to the state of preparing sufu when soybean curd cubes are covered with mycelium but before the material is brined.

RED SUFU: See hon-fan.

SEE-IU (see-iew): Soy sauce of Thailand made from whole soybeans. See soy sauce.

SOY SAUCE: Western term for a dark brown liquid with a salty taste (16 to 18% salt) and a pleasant aromatic odor suggestive of meat extract. It is made by fermenting soybeans, or a combination of soybeans, wheat, and salt with a mixture of molds, yeast, and bacteria. Soy sauce is the prominent, all-purpose seasoning agent used in the Orient. See chiang yu, shoyu, tao-yu, and toyo (Fermented Cereal-Legume Products) and kanjang and see-iu.

SOYBEAN PASTE: Term used in the west for a group of fermented soybean foods used in the Orient. It has an aroma and salty taste similar to that of soy sauce and is a brown paste resembling peanut butter, creamy or chunk style. They are made from soybeans and salt with or without a cereal by a process comparable to that used in soy sauce. In some countries, a variety of bean pastes may be made by varying the ratio of bean to cereal, salt content, fermentation time, or adding other ingredients such as hot pepper. See damsuejang, doenjang, jeonkukjang, taochieo, chiang, kochujang, miso, and tauco (Fermented Cereal-Legume Products).

SUFU: Fermented soybean curd (toufu) from China known as Chinese cheese in the West. It is made from cubes of soybean curd by the action of a mold, *Mucor* or *Actinomucor.* The molded curd cubes are then aged in a salt-wine solution resulting in a soft cheese-type food. Other additives, either to give color or flavor, are frequently incorporated into the brine, resulting in various types of sufu. They are usually consumed as condiments without further cooking.

TAHURI (tahuli): Philippine fermented soybean curd. See sufu.

TAO-CHIEO (tao-jiao): Fermented soybean paste from Thailand made from whole soybeans. See soybean paste.

TAO-HU-YI (tao-hao-yee): Fermented soybean curd from Thailand. See sufu.

TAOKOAN (takoa): Fermented soybean curd of East India, probably similar to sufu.

TEMPÉ BENGOOK: Tempé made from velvetbeans (*Mucuna pruriens* var. *utilis*). See tempeh.

TEMPÉ BONGKREK: Tempé made from partly defatted coconut. See tempeh.

TEMPÉ BONGKREK KATJANG: Tempé made from ground nut press cake. See tempeh.

TEMPÉ ENTHOE: See tempé bongkrek.

TEMPÉ HEMBUS: Tempé made from the residue of soybean curd production. See tempeh.

TEMPÉ KEDELEE (kedele): Tempé made from soybeans. See tempeh.

TEMPÉ KORO: Tempé made from lima or butter beans (*Phaseolus lunatis* L.). See tempeh.

TEMPÉ LAMTORO: Tempé made from seeds of *Leucaena glauca* Berith.

TEMPÉ MORRIE: Tempé made from a mixture of soybeans and partly defatted coconut.

TEMPÉ TIENGGERENG: See tempé bongkrek.

TEMPEH (tempé): Fermented soybean food originated in Indonesia. It is the most extensively investigated fermented soybean product in the West. The tempeh fermentation is rather short and simple. Whole soybeans are soaked overnight and dehulled, or dehulled full-fat soybean grits are soaked for 30 min. They are cooked for 30 min., drained, cooled, surface dried, and then thoroughly mixed with a tempeh starter containing spores of *Rhizopus oligosporus* Saito, NRRL 2710. The inoculated beans are packed in petri dishes or other appropriate containers (traditionally, banana leaves are used) and incubated at 30 to 32°C for 20 to 24 hours. By this time, the beans are covered with white mycelium and bound together as a cake with a pleasant odor. Sliced tempeh can be fried, baked, or added to soup. In Indonesia, the word tempé is a collective name for a food product which is fermented by a *Rhizopus* species.

THUA-KAB: Dry thua-nao. See thua-nao.

THUA-MERK: Wet and cooked thua-nao. See thua-nao.

THUA-NAO: Bacterial fermented soybean product from Northern Thailand. Whole soybeans are soaked, cooked for 3 to 4 hours, drained, and transferred to a bamboo basket lined with banana leaves. The beans are covered with banana leaves and are allowed to undergo natural fermentation for a period of 3 to 4 days until they are very soft and covered with sticky, viscous polymers with a pungent odor of ammonia. The fermentation is similar to that of natto, however, thua-nao fermentation is longer. The product is ground into paste and used as a flavoring agent.

TOSUFU: See sufu.

TOU-FU-RU (toe-fur-ru, teou-fur-ru, tou-fu-ju): See sufu.

TSUE-FAN (tsui-fan, chee-fan): Type of sufu made by fermenting soybena curd. The molded cubes are aged in a brine solution containing a high amount of rice wine. See sufu.

UGBA: Fermented oil bean seeds of *Pentaclethra macrophylla* Benth. brought about by bacteria, mainly *Bacillus*. Obeta. 1983. J. Appl. Bact. 54: 433-435.

WARIES: Hollow, brittle, friable, and spicy balls of 3 to 8 cm in diameter from India. They are used as condiments or adjuncts in cooking. Paste of dehulled black gram [*Vigna mungo* (L.) Hepper] inoculated with a previous batch is fermented for 1 to 3 days at room temperature. The fermented paste is then hand molded into balls and air dried on bamboo or palm mats. *Candida krusei* (Castellani) Benkhout and *Saccharomyces cerevisiae* Hansen are responsible for the fermentation.

Fermented Cereal-legume Products

CHIANG: Fermented soybean paste of China similar to Japanese miso, except that in China chiang may not be ground so that individual particles of soybeans are present. See soybean paste and miso.

CHIANG-YU (chau-yau): Soy sauce of China. It is the same as shoyu, except that in China the ratio of soybeans to wheat may vary from 4:1 to 1:1. See shoyu.

DHOKLA: Food from India. A mixture of coarsely ground wheat and bengal gram flour, at a wheat-to-flour ratio of 4:1, is made into a thick batter with water and salt. The batter is then allowed to ferment overnight.

DOSAI: Traditional food of South India. It is a fermented batter of rice and black gram flour similar to idli except that more rice flour is used in dosai batter. It is also consumed like pancake. See idli.

FERMENTED SOYBEANS: Oriental soybean food prepared from black or yellow soybeans with roasted wheat or rice flour. It is used as a side dish or flavoring agent. The fermented beans have a black color, a salty taste, and a flavor similar to soy sauce. See in-shi (Fermented Legume Products) and hamanatto, tao-si, taotjo, and tou-shi.

HAMANATTO: Japanese name for a product made by fermenting whole soybeans with strains of *Aspergillus* oryzae (Ahlburg) Cohn. The fermented beans are made in the vicinity of Hamanatzu, from which the name of the product was perhaps derived. Soybeans are soaked and steamed until soft, drained, cooled, mixed with parched wheat flour, and then inoculated with a strain of *A. oryzae* (Ahlburg) Cohn. After incubation, the beans are packed with the desired amount of salt, spices, wine, and water, and are aged for several weeks or months. The finished products are blackish and have a salty taste resembling the flavor of shoyu. See fermented soybeans and tou-shi.

IDLI: Spongy pancakes consumed as a staple in many parts of India. They are prepared by steaming fermented dough of rice and black gram [*Vigna mungo* (L.) Hepper] flour. A previous batch serves as inoculum. Fermentation occurs overnight by the joint action of *Torulopsis candida* (Saito) Lodder and *Trichosporon pullulans* (Lindner) Diddens et Lodder. In large cities, baker's yeast is used.

KOCHUJANG (kochu chang): Red pepper sauce of Korea made from soybeans, glutinous rice, hot pepper powder, and salt. To make kochujang meju (koji), a mixture of soaked soybeans and glutinous rice flour is steamed and naturally fermented or inoculated with a previous batch of kochujang. The meju is dried, powdered, and then mixed with hot

pepper flour, cooked glutinous rice, and allowed to rippen. It has a sweet, hot, sour, and salty taste. To prepare for the table, the kochujang is cooked with meat, and honey is added if desired.

KOME MISO: Miso made from rice and soybeans. See miso.

MISO: Japanese word for fermented soybean paste. Miso is a paste resembling smooth peanut butter. Ist color varies from light, bright yellow to dark brownish-red, and its taste varies from sweet to salty. All miso has a distinctive pleasant aroma. Usually, miso is not consumed by itself but is dissolved in water as a base for soup or used as a flavoring agent. Miso fermentation consists of the following: polished rice is washed, soaked, steamed, and inoculated with tane koji [a starter containing various strains of *Aspergillus oryzae* (Ahlburg) Cohn]. The inoculated rice is incubated for 48 to 50 hours at 40 °C or below resulting in rice koji. This step is known as koji making. Whole soybeans are then washed, soaked, and steamed. After cooling, the steamed beans are mixed and mashed together with rice koji and salt. The mixture is inoculated with an appropriate amount of good miso mixed with water to act as starter for yeast and bacteria for the second stage of the fermentation or inoculated with pure culture of yeast and bacteria. It is allowed to ferment at 28 °C for about 7 days; then the temperature is raised to 35 °, and fermentation continues for several months. Various types of miso are produced by varying the ratio of cereal to soybeans, the amount of salt added, and the length of fermentation. See soybean paste, chiang.

MUGI MISO: Miso made from barley and soybeans. See miso.

PHOOL WARIES: Fermented batter of wheat or maize gluten, mung bean paste, spices, and salt from India. Several bacteria are responsible for the fermentation. It is served deep fried and is used as condiment or hors d'ouevre.

RED PEPPER SAUCE: See kochujang.

SHOYU (shoyou, sho-yu): Japanese name for soy sauce. It is made by fermenting a mixture of cooked soybeans and crushed roasted wheat with a starter containing mixed strains of *Aspergillus oryzae* (Ahlburg) Cohn and *A. sojae* Sakaguchi et Yamada. The molded mixture, known as shoyu koji, is transferred to a deep vessel in which a salt solution is added to make a liquid mash of about 18% salt. Strains of *Lactobacillus delbrueckii* (Leichmann) Beijerinck, *Pediococcus halophilus* Mees, *Torulopsis etchellsii* Lodder et Kreger-van Rij, *T. versatilis* (Etchells et Bell) Lodder et Kreger-van Rij, and *Saccharomyces rouxii* Boutroux are added to the mash. The liquid mash, or moromi as it is called by the Japanese, is then fermented and aged at a temperature of 25 to 35 °C for a

few months. It is then pressed and pasteurized for bottling. The proportion of soybeans to wheat may vary but, in Japan, equal amounts of soybeans and wheat are strictly observed. See soy sauce.

SOY SAUCE: Western term for a dark brown liquid with a salty taste (16 to 18% salt) and a pleasant aromatic odor suggestive of meat extract. It is made by fermentation from soybeans, or a combination of soybeans and wheat, and salt, with a mixture of molds, yeast, and bacteria. It is the prominent all-purpose seasoning agent used in the Orient. See kanjang, kecap, and see-iu (Fermented Legume Products); chiang yu, shoyu, tao-yu, and toyo.

SOYBEAN PASTE: Term used in the West for a group of fermented soybean foods used in the Orient. It has an aroma and salty taste similar to that of soy sauce and is a brown paste resembling peanut butter, creamy or chunky style. These foods are made from soybeans and salt with a without a cereal by a process comparable to that used for soy sauce. In some countries, a variety of bean paste may be made by varying the ratio of bean to cereal, salt content, fermentation time or by adding other ingredients such as hot pepper. See chiang, doenjang, miso, and tauco; and tao-chieo (Fermented Legume Products).

TAMARI: Japanese name for a type of shoyu in which greater amounts of soybeans are used than of wheat. See shoyu.

TAO-CHIEO: Soybean paste of Thailand. See miso.

TAO-SI (tu-su): Fermented soybeans of the Philippines. See tou-shi.

TAOTJO (tao-tjo, tao dji): Fermented soybeans made in Indonesia and Thailand; prepared from boiled soybeans mixed with roasted meal of wheat or glutinous rice. This mass is wrapped in hibiscus leaves, which harbor *Aspergillus oryzae* (Ahlburg) Cohn. After molding for 2 or 3 days, the beans are placed in brine and kept several weeks. Palm sugar is added to the brine at intervals. See fermented soybeans, toushi, hamanatto.

TAO-TJUNG: See chiang.

TAO-YU (tou-yu): Chinese name for soy sauce.

TAUCO (taocho, taoco, taucho): Soybean paste of Indonesia. See miso.

TOU-CHIANG: See chiang.

TOU-PAN-CHIANG: Fermented bean paste from China. It is made from fermenting fava beans (*Vicia faba* L.) and adding salt and often hot pepper. The fava beans are washed, soaked, drained, and then covered till sprouting. After removing the hull, the sprouted beans are steamed

for 2 or 3 hours, cooled to 40.C, and then mixed with wheat flour at a beans-to-flour ratio of 2:1. The mixture is inoculated with *Aspergillus* starter, incubated at 36 to 40°C for 4 days, and then aged in brine solution. Hot pepper and other flavoring agents are often added at the later stage of aging. In some areas of China, soybeans also have been used.

TOU-SHI (toushih): Fermented soybeans of China. Dry soybeans are washed, soaked, and then boiled until soft. The beans are cooled, drained, surface dried, and covered with roasted wheat flour. They are then inoculated with suitable strains of *Aspergillus oryzae* (Ahlburg) Cohn or *Mucor* spp. and allowed to grow. Wlithin 2 or 3 days, the mass will be covered with growth of the fungus. The molded beans are then transferred to earthen jars with salt and a small amount of water added. After a few months of aging, the product is ready for consumption. Sometimes the fermented beans are sun dried. See fermented soybeans (Fermented Cereal-Legume Products).

TOYO: Soy sauce of the Philippines made from wheat and soybeans with *Aspergillus*.

TSIANG (tsung): See chiang (Fermented Cereal-Legume Products).

Fermented Fish Products

BAGOONG: One of the primary preserved fish products of the Philippines. It is a staple food in most localities. Bagoong is made by fermenting thoroughly cleaned whole or ground fish, fish roe, shrimp roe, or shell fish in the presence of 20 to 25% salt. It has a reddish-brown color, salty taste, and characteristic fishy, cheese-like flavor. High-quality bagoong has the consistency of a paste, with small pieces of fish, and is usually made from anchovies, goby, herring, small sardines, and tiny shrimps. Cleaned fish are placed in concrete or wooden vats and mixed thoroughly with salt, usually one part of salt for every 2.5 to 3.0 parts of fish. The mixture is allowed to ferment for 3 months to 1 year.

BALAO-BALAO: Fermented whole shrimps of the Philippines.

BALBAKWA: Food from Batangas province of the Philippines. Whole large fish are used. In addition to enzymatic hydrolysis, bacterial action also occurs.

BALEECHONG: See ngapee.

BELACHAN: Shrimp past of Malaysia.

BUDU: Pickled fish product of Malaysia made from anchovies (ikan bilis).

BURO: Salted fish product of the Philippines made from fresh water fish, salt, and fermented rice (ang-kak).

BURONG DALAG: Filipino fish paste made from fish, cooked rice, and ang-kak. It is a lactic acid bacterial fermentation in which the species *Leuconostoc mesenteroides* (Tsenk.) van Tieghem, *Pediococcus cerevisiae* Balcke, and *Lactobacillus plantarum* (Orla-Jensen) Bergey et al. play the major and producing role. Orillo and Pederson. 1968. Appl. Microbiol. 16: 1669-1671.

BURONG HIPON: Shrimp paste from the Philippines.

CA-MAM: Pickled fish made in Vietnam and Thailand from fresh water fish.

CHUKKALS: Fermented and salted sea foods from Korea.

DINAILAN: Shrimp paste of the Philippines.

FERMENTED FISH: One of three highly flavored fish products especially popular in the Far East. These products have a long tradition as a condiment or main dish in the rice-eating region. Many different types of fish products are obtained through lengthy but simple fermentation process. They involve the use of large amounts of salt to select certain useful microorganisms and to inhibit food-poisoning ones. These products are the results of enzymatic digestions from tissues as well as of microorganisms. Whole fish with or without viscera and parts of fish in small chunks are heavily salted, packed into a sealed container, and allowed to undergo natural fermentation for a few days to more than a year with or without adding such ingredients as rice bran, rice flour, maize powder, fermented rice, or pineapple. The fish tissue retains its original structure to some extent. The product can be moist or dried.

FISH PASTE: See fermented fish. This is another popular and highly flavored fish product from the the Asia-Pacific area. Fish or shrimps are salted, ground into fine paste, and allowed to ferment until the desired flavor is developed. In fish paste fermentation, such materials as roasted rice powder, fermented rice, and rice bran are frequently added.

FISH SAUCE: See fermented fish. Fish sauce is the liquid fraction of the fermented fish mass. The fermentation is allowed to go longer, until the fish tissue is broken down and a liquid consisting of protein hydrolysate is formed. This is then clarified from suspended particles and may or may not be further aged to improve flavor.

GYOMISO: Fermented fish paste of Japan.

HIDAL KHUNDA: Fish paste from India and Pakistan.

HOI-DONG: Pickled molluscs from Thailand.

IKAN PEDA: Salty wet fish prepared by fermentation process in Indonesia. Fermentation is carried out by halophilic bacteria or by autolysis.

JEOTKAL (jeot, jotkal): A collective name for a group of salted, fermented seafoods from Korea. There are about 30 kinds of jeotkal mostly consumed as side fishes or flavoring agents.

KAPI: Shrimp or fish paste of Thailand made mainly from marine shrimp and fish.

KATSUOBUSHI: Fermented fish product of Japan that has been molded with one or more species of the *Aspergillus ochraceus* group. Usually bonita are used. The final product is dry and hard and is used to season various dishes. There is some indication that members of the *Aspergillus glaucus* group are also involved. Thom and Church. 1926. The Aspergilli, Williams and Wilkins Co., Baltimore, MD, p. 72-73.

KETJAP IKAN: Fish sauce from Indonesia.

KOAMI: Golden brown liquid containing partially digested shrimps made in Japan by fermentation with salt. It has an aroma resembling salted meat. Crisan and Sands. 1975. Appl. Microbiol. 29: 106-108.

KUNG-CHAO: Product from Thailand similar to pla-cho, except shrimps are used.

KUNG-CHOM: Product from Thailand similar to pla-chom, except that small shrimps are used.

LAMAYO: Shrimp paste of the Philippines.

MAKASSAR FISH: Fermented fish manufactured at Makassar, Indonesia. This preparation is made from small salted fish mixed with angkak, ragi, and spices.

MAM-CA-LOC: Fermented fish (*Ophicephalus striatus* Bl.) paste from Cambodia prepared with roasted rice and fermented rice.

MAM-CA-SAT: Fermented fish (*Pangasius* sp.) paste containing roasted rice from Cambodia.

MAM-CHAO: Fermented fish containing fermented rice from Cambodia.

MAM-NEM: Fermented anchovy paste of Vietnam.

MAM-RUOC: Cambodian and Vietnamese fermented shrimp paste made from freshwater shrimp.

MAM-RUOT: Cambodian fermented paste made with internal fish organs.

MAM-SEING: Cambodian paste of fish eggs.

MAM-TEP: Fermented shrimp paste of Vietnam.

MAM-TOM: Shrimp paste from Annam and the South China.

MAMS: General tern for fermented paste made from fish and crustaceans in Vietnam and Cambodia.

MELUHA: Most popular salted fish in Upper Egypt. Bacilii, micrococci, and yeasts are the predominant groups of microorganisms.

NAM-BUDU: Fish sauce of Thailand made from small filsh or shrimps.

NAM-KHOEI: Shrimp sauce of Thailand made from shrimps and crustaceans.

NAM-PLA: Popular fish sauce in Thailand used as a staple table condiment. It is a clear liquid ranging from yellow amber to dark brown. Nam-pla has a salty taste with characteristic cheesy flavor and odor. Fresh fish are washed, mixed with salt in a fish-to-salt ratio of 1:1-5, and allowed to stand from 5 to 18 months. The liquid is then separated, filtered, aged, and bottled as a first-grade product. The residues are extracted 3 to 4 times with salt water and marketed as second or third grade products.

NGA-BOK-CHAUK: Fermented fish from Burma. Threadfin (*Polynemus indicus*) and sea perch (*Lates calcarifer)* are generally used. The product has a high moisture content.

NGAM-PYA-YE: Fish sauce of Burma. It is the liquid from production of ngapi.

NGAPEE: Shrimp paste from India and Pakistan similar to Burmese ngapi, but ngapee is made from prawns.

NGAPI (nappi): Fermented fish from Burma. Ngapi include not only wet, salted, fermented fish but also shrimp paste.

NUOC-MAM: Extremely popular fish sauce in Vietnam. It is a clear, amber-colored liquid, rich in salt and nitrogen compounds with a characteristic penetrating odor and flavor. Small fish are first kneaded and pressed by hand and then placed with salt in earthenware pots, which are then tightly sealed. These are buried in the ground for several months. The liquid, which is carefully decanted, is known as nuoc-mam, which literally means salty fish water.

NOUC-MAM-GAU-CA: Pickled fish liver from Cambodia.

OUNAGO: Slightly viscous sauce resembling molasses in color with an aroma similar to nampla. In Japan, it is made by fermenting small unidentified fish with salt. Crisan and Sands. 1975. App. Microbiol. 29: 106-108.

PAAK (phaak): See mam-chao.

PADEC: Fish paste from Laos.

PATIS: Fish sauce of the Philippines similar to nam-pla of Thailand and nuoc-mam of Vietnam. It is a clear liquid sauce, straw yellow to amber in color, resulting from slow digestion of salted fish or shrimps. It has a characteristic cheese flavor and a slightly fishy odor. Patis is made by the same method as bangoong except that the fermentation is allowed to go farther.

PEKASAM: Fish product of Malaysia similar to wadi except that cooked rice instead of roasted rice or maize is added.

PLA-CHAO: Fermented fish from Thailand. It is semi-solid, sweet, salty, and slightly alcoholic. It is usually made from catfish. The fish are thoroughly washed, then mixed with salt and placed in a jar. After 3 days, the fish are washed and partially dried. They are then mixed with fermented rice (khao-mak) and fermented for 1 month.

PLA-CHOM: Product from Thailand, similar to pla-chao except that small fish are used.

PLA-RA: Group of popular fermented fish from Thailand. Fresh water fish are thoroughly and heavily salted. The mixture is put into earthenware jars, pressed tightly, and held in place with the aid of bamboo strips for 2 to 3 days to as long as 3 months. After draining off the brine, the salted fish are mixed with rice bran or roasted rice and additional small amounts of salt. The mixture is then allowed to ferment for 3 months to 1 year.

PLA-RA-KAO: See pla-ra. When milled rice is used in making pla-ra, the product is known as pla-ra-kao.

PLA-RA-SOD: Type of pla-ra made from fresh fish.

PLA-RA-RUM: See pla-ra. When wheat bran is used in making pla-ra, the product is known as pla-ra-rum.

PLA-RA-SOD: Type of pla-ra made from fresh fish.

PLA-THU-KHEM: Fermented whole mackerel fish of Thailand.

PLAN-MUM (plam-mam): Fermented fish fillets from Thailand. They are semi-solid, sweet, and salty. Fresh fish are beheaded, scaled, gutted, and sliced into pieces. They are mixed with salt and roasted rice flour, then placed in a jar. After 3 to 6 months, honey or sliced pineapple are added to the salted fish.

PRA-HOC: Fish paste of Cambodia.

SHIOKARA: Fish sauce from Japan made by fermenting viscera and roe.

SHOTTSURU: Fish sauce of Japan.

THIA-PLA: Fish sauce of Thailand prepared from fish viscera.

TINABAL: Bagoong-like product of the Philippines. The fish are thoroughly washed, but the internal organs are not removed.

TRASSI: Fish or shrimp paste of Indonesia. Trassi is a reddish-colored paste of a doughy consistency and has a penetrating characteristic butyric acid smell.

UO-SHOYU: Fish sauce of Japan made by fermentating fish or shell fish meat.

URE-ZUSHI: Fermented fish from Japan made by fermenting pickled fish, boiled rice, and salt.

WADI: Fish product of Malaysia. The fish are salted with the addition of roasted rice or maize.

Fermented Vegetable and Fruit Products

CHIANG-TSAY (chiang tsai): Salt-pickled vegetables from China prepared with chiang or soy sauce (see Fermented Cereal-Legume Products) or tien-mien-chiang (see Fermented Cereal Products).

DONGHHIMI: Fermented radish from Korea. See kimchi.

FERMENTATION OF CITRON: Fermentation of the fruit of citron in a salt brine caused by a yeast, *Saccharomyces*, and a *Bacillus* species. Fellers and Smith. 1936. J. Agric. Res. 53: 859-867.

HUA-CHAI-PO: Fermented whole turnips of Thailand and Taiwan. They are salty.

KIAM-CHAI: Pickled mustard greens from Thailand. They are salty and sour.

KIMCHI: Fermented vegetables of Korea resembling sauerkraut and pickles. These vegetables are large-rooted radishes, cabbages, or Chinese cabbages, to which such spices and flavoring agents as leek, onion, garlic, ginger, and red pepper are added. The vegetables are packed with salt or brine in large stoneware crocks, followed by a lactic fermentation from a few weeks to 4 or 5 months. As much as 200 to 300 g of kimchi per person are consumed by Koreans per day. There are various kinds of kimchi, some of which have ground raw fish or nuts added.

KONG-CHAI: Thai term for salt-pickled Chinse cabbage. It is salty.

MISOZUKE: Salt-pickled vegetables from Japan made in red or sweet white miso for as short as a day or as long as 2 years. Similar to chiang-tsay of China.

MOSTASA: Fermented mustard leaves of the Philippines. The fermentation is initiated by *Leuconostoc mesenteroides* (Tsenk.) V. Tieghem. Orillo et al. 1969. Appl. Microbiol. 17: 10-13.

NATA: Philippine dessert made by fermenting various fruit juices. The bacteria used are not characterized but appear to be species of *Acetobacter*. Each type of substrate used gives a name to the type of nata prepared; thus nata de coco is made from coconut juice, nata de pina is made from pineapple juice, and so on. Sugar is usually added to the juice, and fermentation with acid production occurs. In about 15 days, a solid bacterial layer of polymer 5 to 8-cm thick is formed on the liquid. This layer is removed and cut into small pieces, boiled, and washed until the odor of acetic acid is removed. The cubes of bacterial growth are then placed in a thin sugar sirup and boiled, additional sugar is added and boiled, and then such flavoring agents as lemon or vanilla extract are added. The material can be preserved for a long time. Information can be secured from the National Institute of Science and Technology, Manila, Philippines. The culture of *Acetobacter* sp. used in this fermentation is NRRL B-2942. Adriano et al. 1933. Philipp. J. Educ. 16: 373-379.

NUKA-MISO-ZUKE: Japanese food made by pickling vegetables. They are placed in a mixture of rice bran and salt, fermented, and allowed to ripen. Both yeasts and lactic acid bacteria are present. Otani. 1939. Cent. Bakteriol. II, 101: 139-151.

PAW-TSAY (paw-tsai): Chinese term for vegetable products processed and pickled in a salt solution. Various kinds of vegetables are made into paw-tsay. Most often used are turnips, red peppers, and cabbages. Pieces of vegetables are submerged in boiled water containing 4 to 6% salt in a special vessel that effectively prevents free aeration. The vessel is packed almost to its capacity and kept at room temperature. The total acidity of a sound product reaches 0.5 to 1.0% within a week. Only two principal forms of microorganisms, lactobacilli and yeasts, are developed. In high-quality products, however, yeast is absent or in the minority. The product is salty and sour. Chao. 1949. Food Res. 14: 405-412.

PHAK-DONG : Thai term for pickle vegetables. They are salty and sour.

PHONLAMAI-DONG: Pickled green fruits from Thailand. They are sour or salty or both.

SAJUR ASIN: Literally means salty vegetables. An Indonesian food made from the green leaves of Chinese cabbage, which are fermented with cooked rice flour and salt. The product is salty and slightly sour.

SHIOZUKE: Salt-pickled vegetables from Japan. Vegetables are rubbed with salt and pressed in a container under a heavy weight for 1 to 7 days. Similar to yen-tsay of China.

SI-SEK-CHAI: Pickled mixed vegetables of Thailand. They are salty and sweet.

TAKUWAN: Japanese fermented food, usually yellow, made from dried large-rooted radishes, a variety of nuka-miso-zuke. Lactic acid bacterial fermentation is carried out in wooden casks. The fermented product is consumed as pickles.

TANG-CHAI: Fermented cabbage from Thailand. It is salty and slightly sweet.

TONGKIMCHI: Kimchi made from Chinese cabbages, sliced radishes, red peppers, fish, and other ingredients. See kimchi.

TSUKEMONO: Japanese name for pickles.

YEN-TSAY (yen-tsai): Salt-pickled vegetable from China. Air-dried vegetables, turnip greens, or Chinese cabbages are tightly packed in a container in alternate layers with salt. The contents are covered and weighted. After a few days, a layer of liquid covers the vegetables; the product, which is salty but not sour, is ready for consumption. It is a lactic acid fermentation similar to that of paw-tsay.

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